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ABSTRACT

This case study describes the design of a video tape presentation for use in a college physiology laboratory. A goal of this color film is to demonstrate to the students those techniques involved in anaesthetising and preparing a frog for a laboratory experiment on the reaction of the heart to electrical and chemical stimuli. The film first shows the preparation procedures in normal order, without commentary, and then those same procedures in reverse order (backward chaining) with commentary. The second part of the film shows additional procedures in normal order with commentary. A student handout accompanies the film. Third year biology students were given a questionnaire to evaluate the film for quality of presentation and didactical design. Overall results indicated that the film was a success didactically. The quality of the instructor's presentation in the film and the use of backward chaining received high positive ratings from the students sampled. (MA)

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Heartbeat Registration Experiment

(Rana Esculenta)

Demonstration of the Preparatory Phase

A CASE STUDY IN THE DESIGN OF A VIDEO PRESENTATION FOR USE IN THE PHYSIOLOGY LABORATORY IN THE DEPARTMENT OF COMPARATIVE PHYSIOLOGY AT THE RIJKSUNIVERSITEIT UTRECHT, UTRECHT, THE NETHERLANDS.

Paper presented at: The Third International Conference on Improving University Teaching, Newcastle-upon-Tyne, June 8-11, 1977

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023 229

"Better preparations; reduced incidents of bleeding;
hardly any questions asked".

A Case Study in the Design of a Video Presentation for Use in the Physiology Laboratory in the Department of Comparative Physiology at the Rijksuniversiteit Utrecht, Utrecht, the Netherlands.

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The Netherlands.

Presented as a paper at the Third International Conference on Improving University Teaching, Newcastle-upon-Tyne, June 8-11, 1977.

"Het Kikker Preparaat" (1976)

VCR- colour-sound-21 1/2 min- Dutch
Stichting Film en Wetenschap, Utrecht, The Netherlands
with the Department of Comparative Physiology, Rijksuniversiteit Utrecht (R. Peters and N. Pals) and The Department of Research and Development in Education, Rijksuniversiteit Utrecht (F.A. Earl).

A filmed demonstration of the technique involved in exposing the heart of an anaesthetised frog in preparation for a laboratory experiment on the reaction of the heart to electrical and chemical stimuli. The technique is first demonstrated in normal tempo. A second demonstration is given step-by-step and in reverse sequence (backward chaining). The programme provides for a 2 minute reading pause of a handout describing the steps in the technique. Symbols are used in this handout and in the film to identify the various steps in the technique and assist the viewer in recalling them.

The objective of the video-taped demonstration is to bring the student (viewer) to a state of (1) knowing very clearly what he has to do himself when he steps to the laboratory bench and prepares his frog, and (2) confidence that he can do what the preparation technique demands.

The experiment to which the taped demonstration relates is an experiment in the curriculum of students at the university in the third year of their biology programme.

In June of last year (1976) an opportunity presented itself for demonstrating the contribution that "instructional design thinking" could make to the effectiveness of a laboratory demonstration on video-tape. The film is a 20 minute one and in colour. The demonstration in the film is a demonstration of the anaesthetising of a frog and the attachment of measuring devices to the exposed heart. This is a preparatory step that students themselves must carry out in a laboratory experiment in which the effect of various stimulants (chemical and electrical) on the heart rate of the frog are measured. Faults in technique can be easily made when carrying out this "preparation" for the first time. Some can lead to irreparable damage to the heart and others to bleeding which must be stopped by an instructor assisting in the laboratory. An existing demonstration on video-tape but in black and white was considered by the instructors involved as not effective enough from a didactical point of view. A decision was made to create a new video-tape of the demonstration. The final product was the result of team work between subject matter experts (R. Peters and N. Pals, Rijksuniversiteit Utrecht, Department of Comparative Physiology), a learning systems design specialist (the writer, Department of Research and Development in Education) and media specialists (Stichting Film en Wetenschap, Utrecht).*

The goal which the "instructional design thinking" in the project helped generate, and thereafter reach, can be summed up in the following statement: *The purpose of the film is to bring the student to the state of (1) knowing very clearly what he has to do himself when he steps to the laboratory bench and prepares his frog, and (2) confidence that he can do what the "preparation technique" demands.*

The results of an opinionaire (given to 75 students in a block of 180 students who carried out the experiment) indicated that the didactical design in the film, the quality of the presentation itself, and the quality of the "shooting" of the film contributed significantly to the films learning effect. 96% of the students questioned were "highly positive-positive" that the filmed demonstration gave him or her a very clear understanding of what he or she had to do after stepping into the laboratory. 61% indicated that they were "highly positive-positive" that the filmed demonstration had contributed to their skill in carrying out the preparation.

Task Content

The task of "preparing a frog" for the physiological experiment mentioned above, contains three subtasks. These are (1) the anaesthetising of the frog (2) controlling that the frog is properly anaesthetised and washing away secretements on the skin which could interfere with the experiment, and (3) the preparation per se i.e. the opening of the chest, exposure of the heart, and attachment of leads to the heart from a registration instrument. These three subtasks themselves have identifiable substeps within them. The third subtask, the preparation per se, for example involves the following seven things:

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* The making of the video-tape has been described already elsewhere "Het Kikkerpreparaat", Nico Pals, Registratie, 8e jaargang nr. 4, december 1976 in the Dutch language. N. Pals contributed to the film as an instructor who has assisted in the laboratory in past years, as the demonstrator in the new film and as co-designer of the taped instruction.

(1) the cutting open of the skin in the chest area
(2) the folding back of the opened skin to expose the chest bone
(3) the cutting through of the chest bone
(4) the moving aside of the chest bone structure to give access to the heart
(5) the breaking open of the sack that surrounds the heart
(6) the lifting of the heart and the cutting through of a ligament behind the heart so that the heart is freed and,
(7) the attachment of leads from a recording instrument to the ventricles of the exposed heart.

It is the preparation per se that students are likely to make faults and damage the heart or the abdominal vein that runs through the area in which the work in opening the heart is being done.

The Instructional Design Approach

The instructional design approach used in creating the new video-tape demonstration reflects the notion that designing an effective and valued piece of instruction, demands not only systematic thinking but also creative thinking (Earl, 1976). The first step in creating the film was to analyse the task in total that the student would be required to carry out and to write "indices of satisfactory performance" (ISPs) for each of the elements in the task. An "ISP", as its name implies, indicates precisely what it is that must be done (or not done) when the element in question is carried out in a satisfactory way.

The preliminary analysis and specification of "ISPs" made it possible to list the subtasks and steps-within-subtasks in a "clean" and logical sequence. Special difficulties were at the same time noted for future reference when deciding the didactical design that would be used in the film.

Out of the analysis of the task came the idea, or notion, that it would be most effective to demonstrate/teach the preparation per se first in the film. The second part, it was decided, should concentrate on the more straight forward task of anaethetising the frog. The last minutes, it was thought, should demonstrate the control and washing operation.

The first "gross sequencing" of the teaching/learning process, after much discussion and reflection, lead to the didactical design (the plan, structure and strategy of instruction used) that now steers the learning experience during the showing of the film. The principle features of this "design" are listed below. The rationale reflected in the decisions behind this listing will be subject of comment in the presentation of the film in the conference.

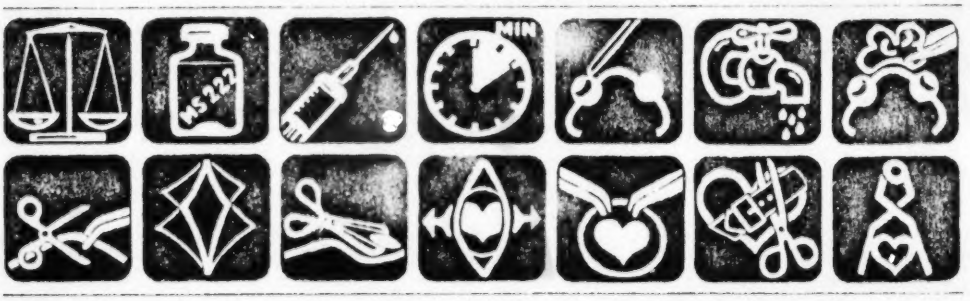
Principle Features of the "design" used

The design (plan, structure and strategy of instruction used) of the video-film being discussed here has the features listed below. That these features contributed to the effectiveness and valuing of the students learning experience is indicated by judgements of the instructors assisting in the laboratory and supervising the work of the students involved. After observing 180 students at work, the three instructors involved were of the opinion that "students made better preparations than students in previous practicums when this particular film was not available as demonstration material".

They based this conviction on the fact that (1) incidents of damage to the heart and of bleeding were much less than in previous experiments, and (2) hardly any questions were asked by the students about what had to be done during their "preparations". Mention has already been made of the students subjective but positive evaluation of their learning experience via the video presentation.

(1) The components in the teaching learning situation that is in progress as the film is shown are: 35 student-viewers, 2 monitors, the video-film itself and a handout to be read soon after the film starts.

(2) The film opens - without the interference of background music - with titles and an overview of the content rolling upwards over the screen. Two background shots are used. The first is of the steps in the total preparation (see figure 1) in symbol form. A fade in shot during the opening moments of the film shows an anaethetised frog - with opened heart - attached to the measuring device that will be used in the experiment. These shots are present without comment.



(figure 1)

(3) The demonstrator next gives a short introduction about what will be demonstrated and how. He makes reference to the didactical strategy that will be used in the film to make the learning experience as active as possible. This introductory statement ends with the demonstrator asking the viewers to read a short description of the steps in the preparation per se. This is the sub task which is carried out last in the laboratory but which, he explains, will be shown first in the film.

(4) The students read the content of the written handout, as directed, during a 2 minute pause. During this pause the content of figure 1 (the symbols) is displayed in the silent screen. It has been explained to them that the first thing they will see, after the 2 minutes pause, is a demonstration without comment of the preparation per se - the opening of the heart and the attachment of the measuring device to the heart of the anaethetised frog. The purpose of the reading pause, it has been explained, is to allow them to observe this first demonstration of the preparation more effectively and to identify the elements in this task.

(5) The demonstration, without comment, of the preparation task (the one mentioned above) is given. The demonstrator then goes to explain that he will now do the preparation a second time but with verbal comments as he works. These comments refer to what it is that he is doing, and to difficulties that can be met. He explains that he will demonstrate the steps this second time in reverse order and explains why.

Note :

This second demonstration is carried out in reverse order. This is making use of the technique known in programmed learning as backward-chaining (Gilbert, 1971; Mechner, 1967). Its use means that the demonstrator starts by showing the method by which the leads from the recording device are attached to the ventricles of the open heart. He ends by demonstrating what is involved in cutting open the skin (see the last seven symbols in figure 1). The thought is (and it seems proven by the students results) that the student will be likely to make fewer mistakes at a given step in the preparation per se when he knows and has seen what has to be done at succeeding steps. Thus, for example, if he knows already what organs and structures lie under the chest bone (he has seen them during the demonstration of the last four steps in the preparation) he will be less likely to make mistakes at the third substep. This is the substep at which he must open the chest. The warning from the demonstrator in the film that "use of the wrong scissors when opening the chest can damage the heart" has far more meaning for the student. He is likely to be far more careful when he comes to open the chest himself in the laboratory.

(6) The second part of the video film covers, in normal (forward) sequence the demonstration of (a) the three substeps in the anaethetising process and (b) the control and skin washing process - see figure 1. The symbols representing the different substeps are displayed in the corner of the screen during this demonstration. The demonstration is made with commentary.

Note :

The anaesthetising of the frog involves (as you can perhaps see from the symbols) : weighing the frog, selecting the correct amount of narcoticum and injecting the narcoticum. The control and washing operation involves: waiting for 10 minutes, checking the eye and leg of the frog for lack of reflex, washing the anaesthetised frog under the tap and, finally, putting cotton wool, soaked in narcoticum, in the mouth of the frog.

(7) The film closes with a reminder by the demonstrator that the frog must be kept moist during the preparation with the help of the saline solution. Credits appear superimposed on the set of the 14 symbols as the film ends. These same symbols were used as background (without any explanation of them) as the film opened.

The film, as mentioned, is in colour. It lasts 20 minutes including the reading pause. The filming itself took place in the Stichting Film en Wetenschap, Utrecht on 1 July 1976. The video-tape demonstration was installed in the curriculum of 3rd year Biology students end of August 1976.

Some Results

Sampling of student opinion in respect to the instructional objectives set (cf. page 1), indicated that the video-tape demonstration had didactically been a success. This was confirmed by the observation of the instructors about the quality of the students "preparations" of their own frogs in the laboratory.

Students were asked to give their opinions on several features of the didactical design used. These features and the percentage of positive responses of the 75 students questioned were as follows: the reading assignment (47% positive); the quality of the instructors presentation in the film (81% positive); the use of symbols (44% positive) and the use of "backward chaining" (71% positive). One could speculate that value of the symbols in the learning experience is probably underrated.
This use of symbols probably played a very vital role in the effectiveness of the reverse order demonstration of the preparation per se.

Closing Remarks

The experience of making this video-tape presentation and the obtained results has suggested certain things that might be usefully noted here. These are (1) the demonstrated effectiveness of the use of backward chaining in instructional films (2) the value of a carefully "programmed" scenario in the hands of the media specialists (3) the value of a sound didactical plan, structure and strategy of instruction in a film that has to teach, and (4) the advantage of using a presentator who can bring the strategy of instruction across in a good way. Less arguable but still speculative are the advantages and possibilities of using handout materials during a filmed presentation to help observation; and the use of symbols to reinforce learning.

References:

Earl, F.A. (1976), The four referents, a concept of design to assist teachers to improve their performance as instructional designers; Afdeling Onderzoek en Ontwikkeling van Onderwijs, Rijksuniversiteit Utrecht.

Gilbert, T.F., (1971). Mathetics: The Technology of Education. In :Merrill M.D. Instructional Design: Readings (214-263), Prentice Hall, Inc., Englewood Cliffs, New Jersey.

Mechner, F. (1967), Behavioral analysis and instructional sequentcing. In: Lange, P.C., Programmed Instruction, 66e yearbook of the national society for the study of education, part II. The University of Chicago Press.